San Diego County Post-2003 Fire Quino Checkerspot Butterfly Monitoring Burned Area Emergency Rehabilitation Plan Final Accomplishment Report

12/12/07
Organization Code 11430
Subactivity 9262
Project AXE7

Prepared for
Bill Leenhouts
Branch of Fire Management
U.S. Fish and Wildlife Service
3833 S. Development Ave.
Boise, ID 83705
208-387-5584
Bill_Leenhouts@fws.gov

Prepared by
Alison Anderson
Carlsbad Fish and Wildlife Office
Fish and Wildlife Service
6010 Hidden Valley Rd.
Carlsbad, CA 92011

Background

The Quino checkerspot butterfly (QCB) is a federally listed endangered species endemic to San Diego and Riverside Counties, and Baja California Norte, Mexico. Due to drought and habitat loss, populations are severely reduced in abundance and distribution from historic levels (Service 2003a). The populations and habitat affected by the Otay ("Mine") Fire in 2003 represented a significant portion of the remaining species distribution (Figure 1). The Otay Fire affected 53% of all QCB observations reported within the Southwest San Diego Recovery Unit (Service 2003b). Three Core Occurrence Complexes (putative population distributions based on butterfly observation locations; Service 2003a) were entirely or partially within the high severity area burned by the fire (IBAERT 2003). These occurrences represented the majority of butterfly observations in the recovery unit (i.e. occurrence locations outside the fire encompass far fewer individual butterfly observations; Service 2003b). The purpose of this study was to identify fire-caused mortality of QCB, and any evidence of loss of population resilience, in critical occurrences on Bureau of Land Management (BLM) and U.S. Fish and Wildlife Service (USFWS)-managed lands within the Otay Fire perimeter (Service 2003b).

Methods

Monitored sites were locations where QCB had been observed since 1990 within mapped Occurrence Complexes (Service 2003a and 2003b). Monitoring surveys were conducted at 6 primary sites (Figure 1) within 200 meters of reported butterfly observations (Appendices I and II). Monitoring of QCB and associated habitat was conducted in accordance with the established protocol (Service 2002).

Results

All six occupied areas within the Otay (Mine) Fire burn that were monitored were still occupied, and QCB were also reported from all adjacent unburned areas that were surveyed (Table 1; CFWO 2005-2006).

Conclusions

The results of post-fire QCB observations and monitoring were generally positive, indicating continued persistence of occupancy after fire. Most surveyors and CFWO staff reported small patches of unburned habitat within or adjacent to fire perimeters, where hostplants and in some cases even larvae (CFWO 2004; 2006), were found. Although no QCB were detected on surveyed Federal land at the Otay Lakes north site (a sub-area of the Otay Lakes site), one adult was observed incidentally on a hilltop central to and above survey areas (Table 1), indicating post-fire recolonization or continued low-density occupancy at that site. A fire-affected threat to population resilience noted by contracted surveyors and CFWO staff is that the fires appeared to exacerbate the exotic plant invasion (e.g., *Erodium sp.*; CFWO 2006) that is already ubiquitous throughout the species range (Service 2003a).

Monitoring of areas adjacent to the Otay Fire perimeter provided comparative evidence of negative fire impacts as well. In 2005, the smaller Border 50 Fire burned most habitat within the Marron Valley Core Occurrence Complex west of Otay Mountain that was not burned in the 2003 Otay Fire (Service GIS database). In 2007 the northernmost occupied areas adjacent to the Otay fire perimeter (Honey Springs and Dulzura non-core occurrence complexes; Service 2003a) had the highest adult QCB densities of any monitored/occupied areas, and the only observed QCB larvae (CFWO 2007). These areas were the only monitored sites in the Otay Unit not affected by the 2003 and 2005 fires. Although hostplant abundance and condition at the Otay lakes and Marron Valley sites affected by the fires appeared similar to those at the northernmost sites, no larvae or adults were observed at either site (CFWO 2007). Therefore, observed high relative QCB abundance in 2007 in the Honey Springs and Dulzura areas (CFWO 2002; 2003; 2004; 2005; 2006; 2007) compared to similar proximal sites was probably due to lack of fire impacts over the past 4 years. Although no QCB populations were completely extirpated by the 2003 and 2005 fires (Table 1; CFWO 2004; 2005; 2006), QCB densities and the extent of occupied habitat appears to have been reduced (table 1; CFWO 2007). Furthermore, warmer, drier climatic conditions are likely to continue and intensify (IPCC 2007), resulting in lower annual average habitat suitability and more frequent fire. Therefore, we conclude that QCB population resiliency within the Otay Recovery Unit has likely been compromised by the 2003 fires, and is not likely to be reestablished without short-term population density management, and short and long-term habitat management.

We recommend continued monitoring of QCB populations, host-plant use, and weed invasion in QCB post-burn habitat. We also recommend initiation of a plan for butterfly ranching and/or habitat enhancement to increase recruitment and augment populations (Service 2003b). Funding already exists for ranching and habitat enhancement through mitigation funds for a CalTrans project (State Route 125 South). Butterfly ranching is defined as habitat enhancement above and beyond natural suitability and on-site captive rearing of locally collected larvae (Service 2003a). Adults recruit naturally to the surrounding habitat where they were collected as immature individuals. Ranching is undertaken strictly to augment a decimated population using local stock, and does not involve captive propagation or translocation of stock from other populations. Unaffected QCB locations within all affected Occurrence Complexes should provide sources of local recruitment to burned habitat.

Literature Cited

Carlsbad Fish and Wildlife Office (CFWO). 2002. Quino checkerspot butterfly monitoring. Internet website, http://www.fws.gov/carlsbad/Rules/QuinoDocuments/Quino_htms/Quino_update_05_14_02.htm, accessed August 16, 2008.

Carlsbad Fish and Wildlife Office (CFWO). 2003. Quino checkerspot butterfly monitoring. Internet website,

http://www.fws.gov/carlsbad/Rules/QuinoDocuments/Quino_htms/Flight_Info_2003.htm, accessed August 16, 2008.

Carlsbad Fish and Wildlife Office (CFWO). 2002. Quino checkerspot butterfly monitoring. Internet website, http://www.fws.gov/carlsbad/Rules/QuinoDocuments/Quino_htms/Quino_update_05_14_02.htm, accessed August 16, 2008.

Carlsbad Fish and Wildlife Office (CFWO). 2003. Quino checkerspot butterfly monitoring. Internet website, http://www.fws.gov/carlsbad/Rules/QuinoDocuments/Quino_htms/Flight_Info_2003.htm, accessed August 16, 2008.

Carlsbad Fish and Wildlife Office (CFWO). 2004. Quino checkerspot butterfly monitoring. Internet website, http://www.fws.gov/carlsbad/Rules/QuinoDocuments/Quino_htms/2004%20Quino%20monitoring%20info.htm, accessed August 16, 2008.

Carlsbad Fish and Wildlife Office (CFWO). 2005. Quino checkerspot butterfly monitoring . Internet website, http://www.fws.gov/carlsbad/Rules/QuinoDocuments/Quino_htms/2005%20Quino%20monitoring%20info.htm, accessed August 16, 2008.

Carlsbad Fish and Wildlife Office (CFWO). 2006. Quino checkerspot butterfly monitoring 2006. Internet website, http://www.fws.gov/carlsbad/Rules/QuinoDocuments/Quino_htms/2006%20Quino%20monitoring%20info.htm, accessed August 16, 2008.

Carlsbad Fish and Wildlife Office (CFWO). 2007. Quino checkerspot butterfly monitoring, 2007. Internet website, http://www.fws.gov/carlsbad/Rules/QuinoDocuments/Quino_htms/2007%20Quino%20monitoring%20info.htm, accessed August 16, 2008.

Interagency Burned Area Emergency Response Team (IBAERT). 2003. 2003 Southern California Fires: Plan Maps. Burned Area Emergency Stabilization and Rehabilitation Plan Volume II. Submitted to the Bureau of Indian Affairs, Bureau of Land Management, and U.S. Fish and Wildlife Service 11/17/2003.

Intergovernmental Panel on Climate Change: Working Group I (IPCC). 2007. Climate Change 2007: The Physical Science Basis: Summary for Policymakers. IPCC Secretariat, Geneva, Switzerland.

U.S. Fish and Wildlife Service (Service). 2002. Quino Checkerspot Butterfly (*Euphydryas editha quino*): Survey protocol Information. Carlsbad Fish and Wildlife Office, Carlsbad, California.

U.S. Fish and Wildlife Service (Service). 2003a. Recovery Plan for the Quino Checkerspot Butterfly (*Euphydryas editha quino*). Portland, Oregon.

U. S. Fish and Wildlife Service (Service). 2003b. Interagency Burned Area Rehabilitation Plan for the Quino Checkerspot Butterfly. Plan submitted to the Bureau of Indian Affairs, Bureau of Land Management, and U.S. Fish and Wildlife Service.

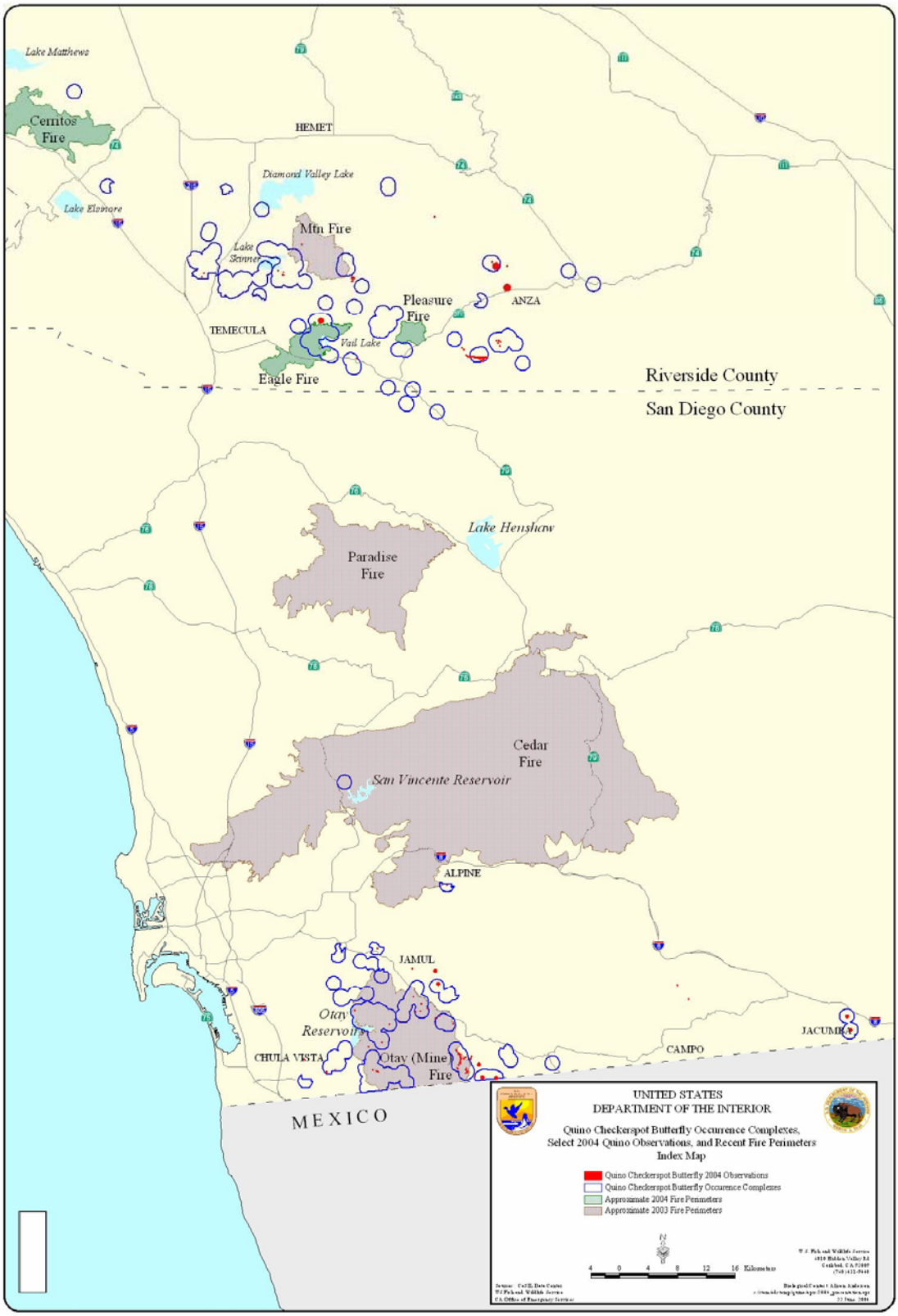


Figure 1. QCB 2004 Occurrence Complexes and Fire Perimeters.

Table 1. Post-2003 Fire Monitoring Summary Information.

Site	Contractor (Permitee)	CFWO Report #	Year	Results
Otay Lakes South	USFWS/Caltrans (John D.) and Mike Klein	CFWO 7048	2004*	Positive
	USFWS/Caltrans (John D.) and Mike Klein	7362 7516 6635	2005*	Positive
	USFWS/Caltrans (John D.) and Mike Klein	CFWO 7517 7702	2006*	positive
Otay Mt.	UCR (Dr. Gordon Pratt)	7078	2004	positive
	Klein-Edwards P.S. (Mike Klein)	6634	2005	positive
	Klein-Edwards P.S. (Mike Klein)	7703	2006	positive
Otay Lakes North	UCR (Dr. Gordon Pratt)	7078	2004	negative
	AWCS (Jason Wolfe)	6740	2005	negative
	Tierra E.S. (Monica Alfaro)	7808	2006	positive **
Proctor Valley	AMEC E&E Inc. (Julie Simonsen-Marchant)	6194	2004	negative
	Mooney J&S (Ted Lee)	6963	2005	negative
	Mooney J&S (Ted Lee)	7746	2006	positive
Rancho Jamul	PSBS (Doug Allen)	6631	2004	positive
	PSBS (Doug Allen)	6667	2005	positive
	Mooney J&S (Ted Lee)	7777	2006	positive
Dulzura	AWCS (Jason Wolfe)	3699	2004	positive
	AWCS (Jason Wolfe)	6738	2005	negative
	ECORP (Christine Tischer)	7823	2006	positive
Marron Valley West	Chambers Group (Christine Tischer)	3702	2004	Positive
	ECORP (Christine Tischer)	6604	2005	positive
	ECORP (Christine Tischer)	7822	2006	positive

* Non-BLM funding (USFWS funding or volunteer).

** Incidental observation on private property on hilltop above/in middle of survey areas.

Appendix I

U. S. Fish and Wildlife Service (Service). 2003b. Interagency Burned Area Rehabilitation Plan for the Quino Checkerspot Butterfly. Plan submitted to the Bureau of Indian Affairs, Bureau of Land Management, and U.S. Fish and Wildlife Service.

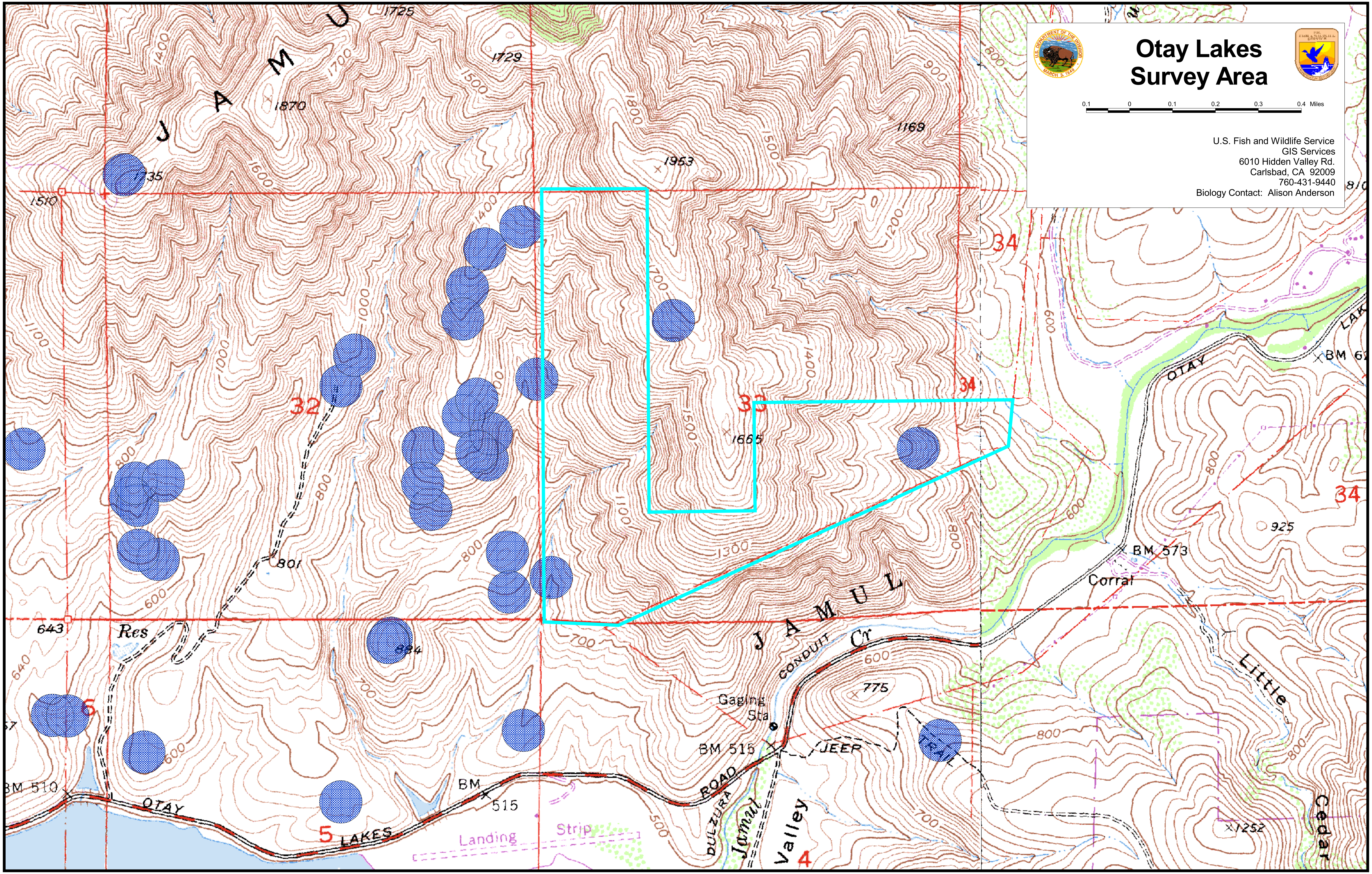
Appendix II

Survey area maps with property boundaries and Quino checkerspot butterfly observation locations.

Appendix III

Budget and Annual Expenditures for Quino post-fire monitoring 2004-2006.

Year	Budget	Expenditure
2004	$22,200	$23,473
2005	$22,200	$21,520
2006	$22,200	$21,100
Total	$66,600	$66,093


Otay Lakes
Survey Area
0.1 0 0.1 0.2 0.3 0.4 Miles
U.S. Fish and Wildlife Service
GIS Services
6010 Hidden Valley Rd.
Carlsbad, CA 92009
760-431-9440
Biology Contact: Alison Anderson
J A M U L
1725
1729
1870
1735
1510
1953
1169
32
33
34
1665
801
643
Res
834
6
5
4
BM 510
OTAY
LAKES
ROAD
BM 515
Landing
Strip
DULZURA
Jamul
Valley
JEEP
TRAIL
Gaging
Sta
CONDUIT
Cr
775
BM 573
Corral
925
Little
Cedar
1252
OTAY
LAK
BM 62

OTAY RESERVOIR

SPILLWAY 491

Jamul

604 Res

San Ysidro Mts

OTAY NATIONAL

FIREBREAK

JEEP TR

Cove

Village 15 Survey Area

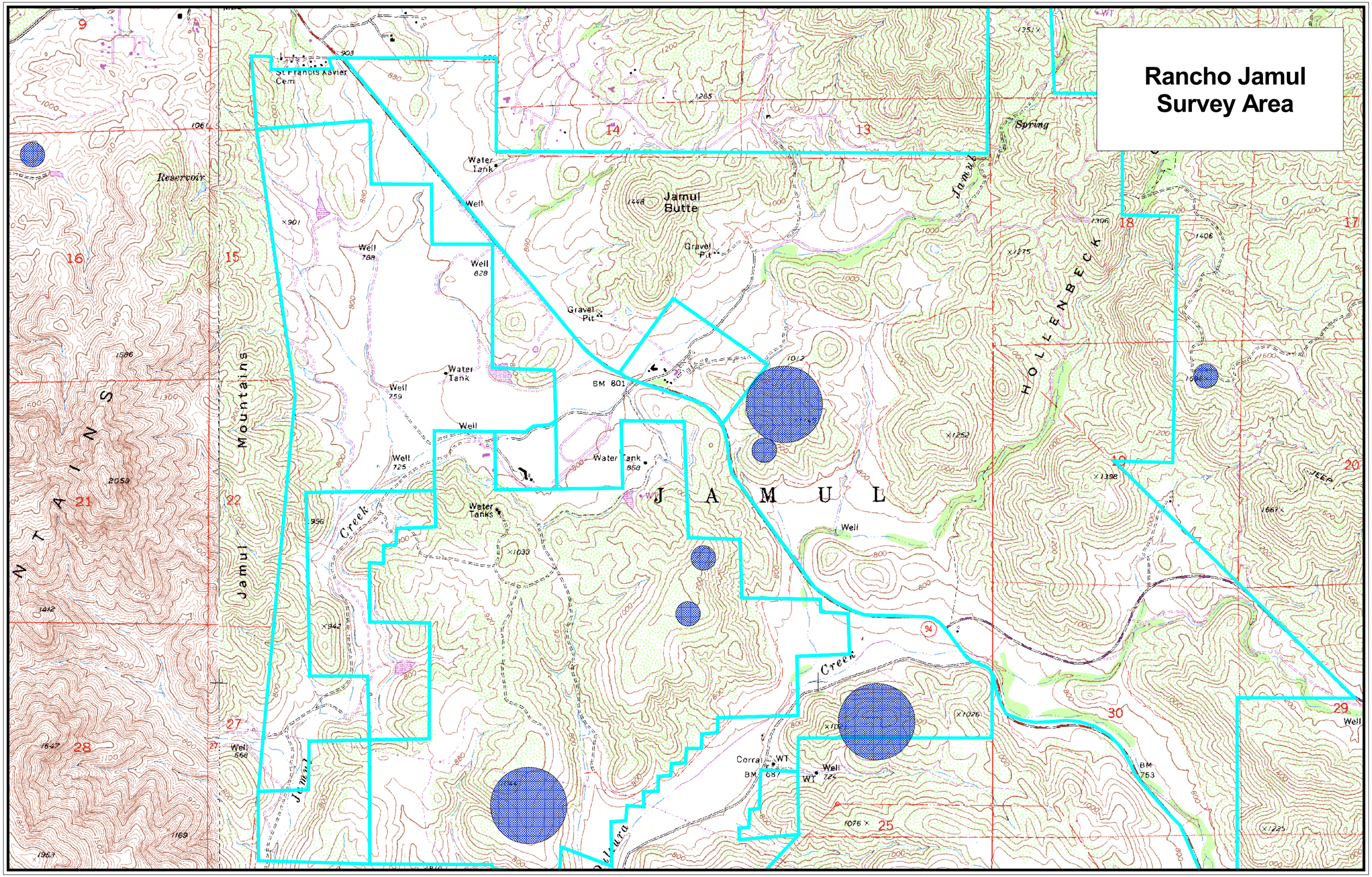
San Vicente Survey Area

0.2 0 0.2 0.4 0.6 Miles

N

U.S. Fish and Wildlife Service
GIS Services
6010 Hidden Valley Rd.
Carlsbad, CA 92009
760-431-9440
Biology Contact: Alison Anderson

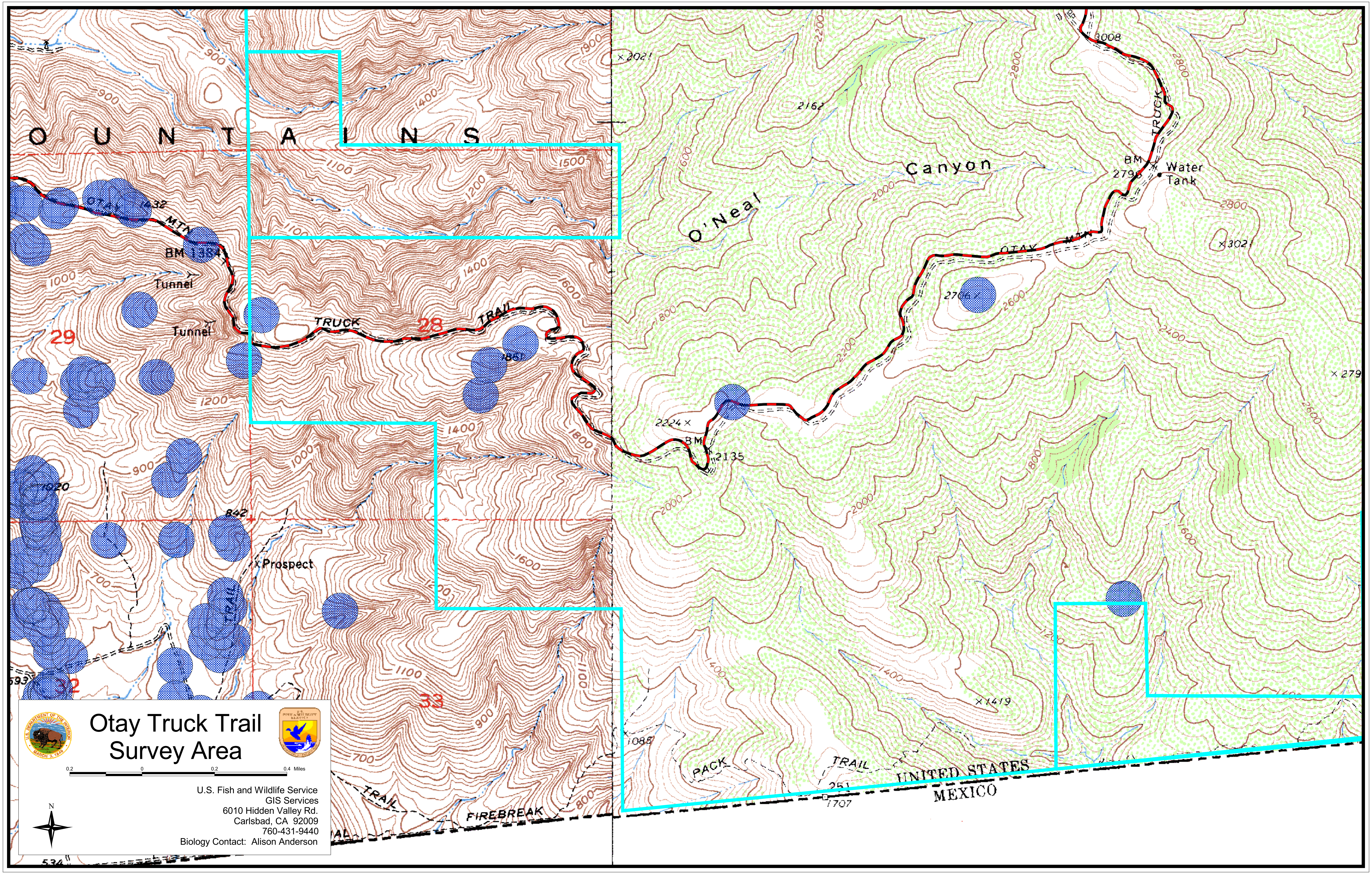
Rancho Jamul Survey Area



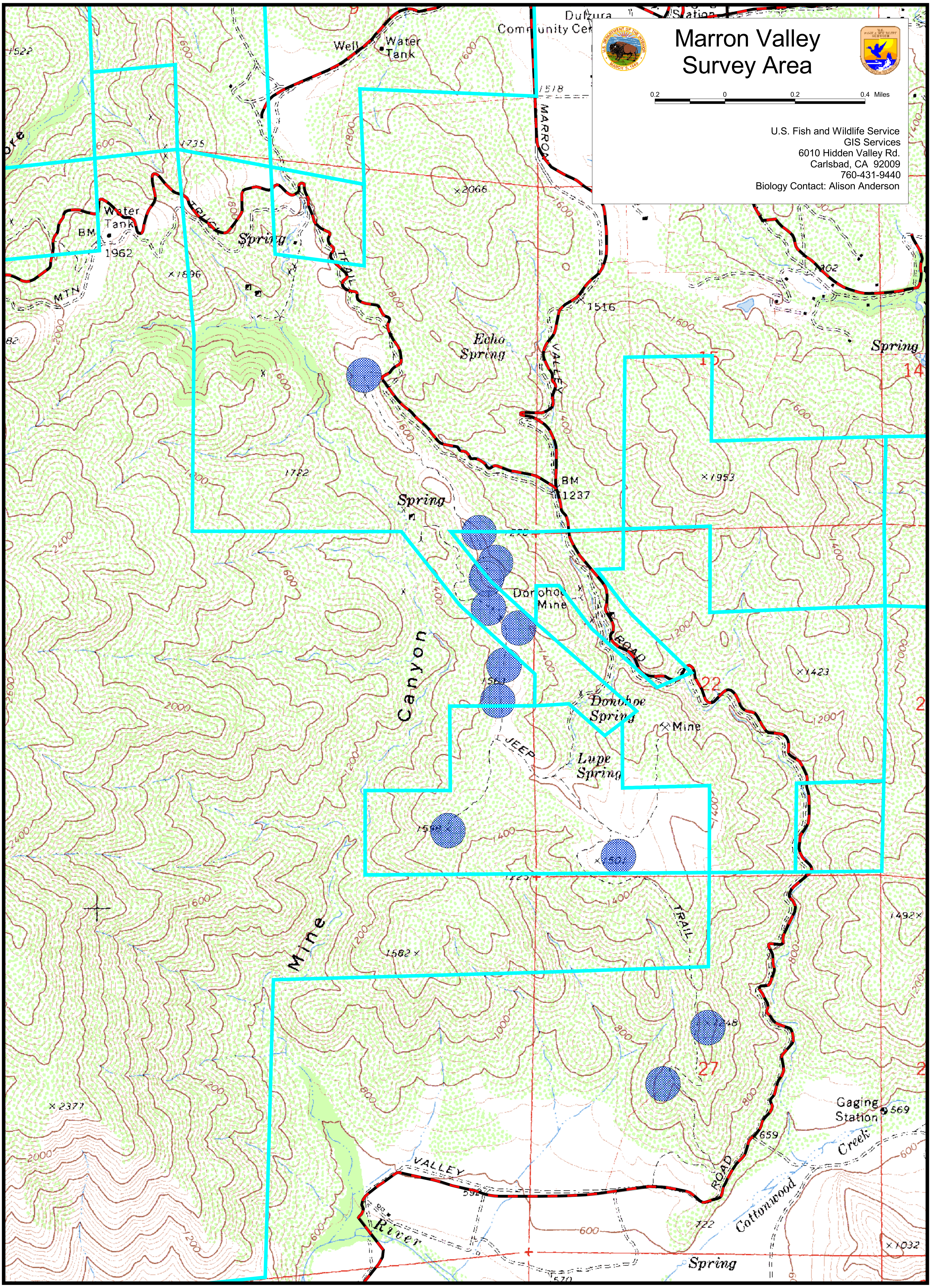
Proctor Valley Survey Area

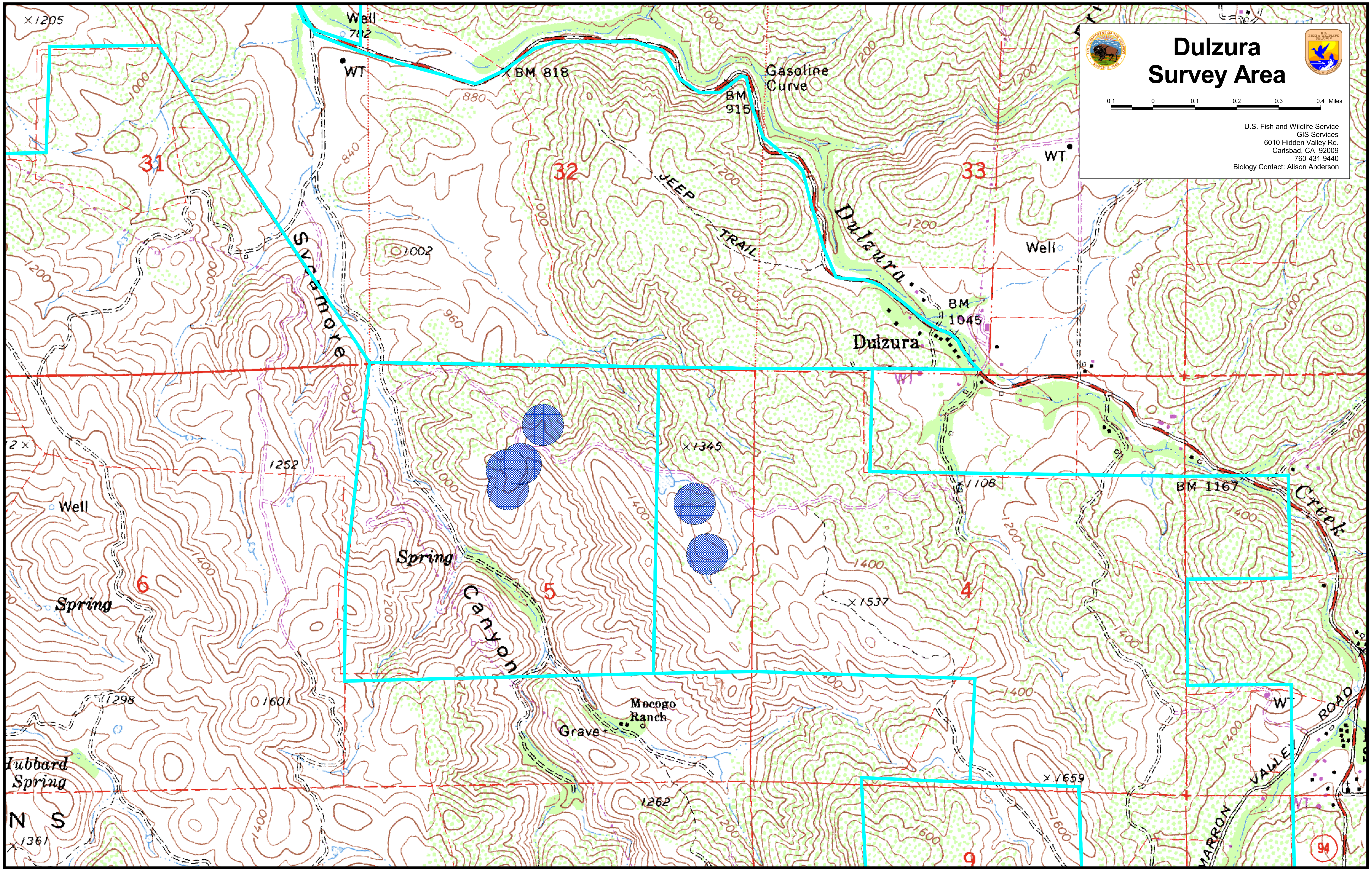
0.2 0 0.2 0.4 Miles

U.S. Fish and Wildlife Service
GIS Services
6010 Hidden Valley Rd.
Carlsbad, CA 92009
760-431-9440
Biology Contact: Alison Anderson



O U N T A I N S
OTAY
1432
MTN
BM 1384
Tunnel
Tunnel
29
TRUCK
28
TRAIL
1020
842
Prospect
TRAIL
593
32
33
FIREBREAK
TRAIL
534
×2021
2162
O'Neal
Canyon
2224 ×
BM
2135
3008
TRUCK
BM
2796
Water
Tank
OTAY
MTN
2706
×3021
×279
1085
PACK
TRAIL
251
1707
×1419
UNITED STATES
MEXICO
Otay Truck Trail
Survey Area
0.2 0 0.2 0.4 Miles
U.S. Fish and Wildlife Service
GIS Services
6010 Hidden Valley Rd.
Carlsbad, CA 92009
760-431-9440
Biology Contact: Alison Anderson
N


Marron Valley
Survey Area
0.2 0 0.2 0.4 Miles
U.S. Fish and Wildlife Service
GIS Services
6010 Hidden Valley Rd.
Carlsbad, CA 92009
760-431-9440
Biology Contact: Alison Anderson
Dulzura
Community Cen
Well
Water Tank
1522
1735
Water Tank
BM
1962
TRUCK
Spring
TRAIL
MTN
1896
x2066
1518
MARRON
1516
Echo Spring
VALLEY
1802
Spring
15
14
1722
Spring
BM
1237
x1953
Donohoe Mine
ROAD
Canyon
22
x1423
Donohoe Spring
Mine
Lupe Spring
JEEP
TRAIL
1492x
1582 x
Mine
27
x 2377
Gaging Station
569
659
VALLEY
592
ROAD
Creek
Cottonwood
River
722
Spring
x1032
570



Dulzura Survey Area
0.1 0 0.1 0.2 0.3 0.4 Miles
U.S. Fish and Wildlife Service
GIS Services
6010 Hidden Valley Rd.
Carlsbad, CA 92009
760-431-9440
Biology Contact: Alison Anderson
Well
782
WT
BM 818
Gasoline Curve
BM 915
31
32
33
JEEP TRAIL
Dulzura
Dulzura Creek
BM 1045
Well
WT
Sycamore Canyon
1002
1205
1252
1345
1108
BM 1167
Well
Spring
Spring
6
5
4
9
1537
1298
1601
Mocogo Ranch
Grave
Hubbard Spring
1659
1262
1361
WT
MARRON VALLEY ROAD
94

2003 So. Cal. Fires

Burned Area
Rehabilitation Plan

U.S. Fish and Wildlife Service

REVIEW AND CONCURRENCE

Burned Area Rehabilitation Concurrence

Therese O'Rourke, Project Leader, Carlsbad Fish and Wildlife Office, FWS Date

Burned Area Rehabilitation Approval

Steve Thompson, Manager, California Nevada Operations, FWS Date

Post-Rehabilitation Restoration Funding Approval

Steve Thompson, Manager, California Nevada Operations, FWS Date

INTERAGENCY BURNED AREA REHABILITATION PLAN

BACKGROUND/JUSTIFICATION

The below specification is very similar, and has the same intent as the T& E species monitoring specification on page 89 of the 2003 So. Cal. Fires Burned Area Emergency Stabilization and rehabilitation Plan (IBAERT 2003). We have written a new specification because;

1) We understand that the original proposal was not approved in part because it was classified as an "emergency stabilization" action, and should have been classified as a "rehabilitation" action (Jack Hamby, BLM, pers. comm. 2004),

and

2) We would like to modify and further explain some aspects of the proposal that may have been misunderstood and thus caused concern, or otherwise needed clarification.

PART F – SPECIFICATION

SPECIFICATION TITLE:	**T& E SPECIES MONITORING**	**JURISDICTIONS:**	**FWS BLM**
PART E: LINE ITEM:	**WL-1 T&E SPECIES MONITORING**	**FISCAL YEAR:**	**FY 04**
ESR REFERENCE #:	**6.3.8 Threatened and Endangered Species**	**SPECIFICATION TYPE:**	**R**

I. WORK TO BE DONE

A. General Description:
Identify fire-caused mortality of Quino checkerspot butterflies and any subsequent loss of population resilience in critical occurrences that could jeopardize the species.
B. Location (Suitable) Sites:
Bureau of Land Management (BLM) and U.S. Fish and Wildlife Service (USFWS) managed lands in the Southwestern San Diego Recovery Unit within the Otay Fire perimeter that are known to have been recently occupied by the Quino checkerspot butterfly.
C. Design/Construction Specifications:
The Quino checkerspot butterfly flight season is projected to begin in late February based on current USFWS monitoring at unaffected sites (Carlsbad Fish and Wildlife Office public website). Surveys must begin in March to be effective. Initial monitoring may be done by USFWS staff (we currently have $3,700 funded by the USFWS through the original BAER plan) and permitted volunteers, however effective monitoring requires more funding/year for

several years.

Sites to be surveyed/monitored are locations where Quino have been observed since 1990 within mapped Occurrence Complexes. Surveys will occur at 6 sites within 200 meters of reported butterfly observations (map attached). Monitoring of Quino checkerspot butterflies and associated habitat will be conducted in accordance with the established protocol (2003 So. Cal. Emergency Stabilization and Rehabilitation Plan, p. 90).

D. Purpose of Treatment Specification:

The Otay Fire affected 53% of all Quino checkerspot butterfly observations reported within the Southwest San Diego Recovery Unit (attached map). 2.5 of the three core Occurrence Complexes (putative population distributions based on butterfly observation locations) were within the high severity area burned by the fire (BAER Map Volume, **8d)**. These occurrences represent the majority of butterfly observations in the recovery unit (i.e. occurrence locations outside the fire encompass far fewer total butterfly observations). It is possible that the butterflies (caterpillar diapause stage) were killed by the fire. Because this is a federally listed Endangered species, it is critical to determine mortality and possible loss of population resiliency. If decreased butterfly numbers reduce population resiliency and the population is not expected to recover without assistance, the next step would be to initiate butterfly ranching and habitat enhancement (population augmentation within an occurrence complex or metapopulation) to prevent loss of the species. The Quino checkerspot butterfly is endemic to San Diego and Riverside Counties, and Baja California Norte, Mexico. Due to drought and habitat loss, populations are severely reduced in abundance and distribution from historic levels. The populations and habitat affected by the fire represent a significant portion of the remaining distribution and designated critical habitat. More information can be found in the BAER Wildlife Assessment and the Recovery Plan for the Quino Checkerspot Butterfly (*Euphydryas editha quino*) (USFWS 2003).

E. Treatment effectiveness monitoring

Presence-absence monitoring of unaffected sites will be conducted per the existing USFWS program (CFWO website) to confirm presence of a recruitment source. After three years of monitoring, if fewer average Quino checkerspot butterflies are observed/visit in burned sites than were previously recorded on-site, butterfly ranching and/or habitat enhancement will be undertaken to increase recruitment and augment the population. Funding already exists for ranching and habitat enhancement through mitigation funds for a CalTrans project (State Route 125 South). If total annual January and February rainfall during any of the monitoring years is not within one standard deviation of the average total for those months over the past 30 years, presence-absence data will be substituted for the abundance threshold above when determining the need for ranching or habitat enhancement.

Butterfly ranching is defined as habitat enhancement above and beyond natural suitability and on-site captive rearing of locally collected larvae. Adults recruit naturally to the surrounding habitat where they were collected as immature individuals. Ranching is undertaken strictly to augment a decimated population using local stock, and does not involve captive propagation or

translocation of stock from other populations. Unaffected Quino locations within all affected Occurrence Complexes should provide sources of local recruitment to burned habitat. Host plant surveys in 2004 of occupied habitat within the Otay Fire footprint (see attached map) also revealed portions of larval host plant patches that were not burned (A. Anderson and J. Digregoria pers. observ. 2004), another potential source of recruitment. Therefore, ranching and/or habitat enhancement should successfully restore population resilience if applied.

II. LABOR, EQUIPMENT, MATERIALS, AND OTHER COSTS

PERSONNEL SERVICES (Grade @cost/Hours X # HoursX fiscal Years = Cost/Item. **Do not include contract personnel costs here (see contractor services below).**	**COST/ITEM**
GS-11 (FWS Entomologist) @30/hour X 60 hours X 2 FY	$5400.00
TOTAL PERSONNEL SERVICES COST	$5400.00
EQUIPMENT PURCHASE, LEASE, OR RENTAL (Item @ Cost/Hours or Cost/Day or # days X # Fiscal Years = Cost/Item) Note: Purchase requires written justification that demonstrates cost/item benefits over lease or rental.	**COST/ITEM**
None	
TOTAL EQUIPMANT PURCHASE, LEASE, OR RENTAL COST	
MATERIAL AND SUPPLIES (Item @ Cost/each X Quantity X Fiscal Years = Cost/item)	**COST/ITEM**
None	
TOTAL MATERIAL AND SUPPLIES COST	
TRAVEL (Personnel or Equipment @rate X Round Trips X # Fiscal Years = Cost/Item)	**COST/ITEM**
None	
TOTAL TRAVEL COST	
CONTRACTS (labor or equipment @Cost/Hour x # Hours X Fiscal Years = Cost/Item)	**COST/ITEM**
Survey 1 location per day X 6 sites X 5 visits per site X 3 years = 90 days @ 8 hours per day (includes OH) X $85 per hour (high cost reflects need for contractor to have high skill level and be permitted by FWS to conduct surveys) = $61,200	$61,200
TOTAL CONTRACTS COSTS	$61,200

FISCAL YEAR	UNIT	UNIT COST	# OF UNITS	COST	FUNDING SOURCE	METHOD
2004	**FY**	**$22,200**	**1**	**$22,200**	**R**	**P C**
2005	**FY**	**$22,200**	**1**	**$22,200**	**R**	**P C**
2006	**FY**	**$22,200**	**1**	**$22,200**	**R**	**P C**

TOTAL		**$66,600**	**3**	**$66,600**		

FUNDING SOURCES	**SPECIFICATION TYPE**	**METHOD OF COMPLETION**
F = Fire suppression	ES = Emergency Stabilization	P = Agency Personnel Services
ESR = Emergency Stabilization and Rehab	R= Rehabilitation	C = Contract
OP/O = Agency Operating Fund	FS = Fire Suppression	EFC = Emergency Fire Contract
EWP = Emergency Watershed Program		FC = Crew Labor Assigned to Fire

SOURCE OF COST ESTIMATES

Put Letter (P, M, C, or F) Next to Appropriate Cost Estimate Source (1-5) Below	
1. Estimate obtained from 2-3 independent contractual sources.	
2. Document cost figures from similar project work obtained by agency sources.	P C
3. Estimate supported by cost guides from independent sources or other federal agencies.	
4. Estimates based on government wages rates and material cost.	P
5. No cost estimate required – cost charged to Fire Suppression Account (not tracked in plan).	
P=Personnel Services M=Materials/Supplies T=Travel C=Contract F=Suppression	

III. RELEVANT DETAILS, MAPS, AND DOCUMENTATION INCLUDED IN THIS REPORT

List Relevant Documentation and Cross-References within ESR Plan
Wildlife BAER assessment, Emergency Consultation Package, attached survey protocol, attached updated survey location map and BAER Map Volume, **8d**.

IV. SPECIFCATION COST TOTALS

TOTALS BY JURISDICTION BY FIRE BY UNIT	**UNITS TREATED**	**COST**
BLM- Otay	4 survey sites	$44,400
FWS -Otay	2 survey sites	$22,200
TOTALS BY JURISDICTION BY FIRE		
BLM -Otay	4 survey sites	$44,400
FWS -Otay	2 survey sites	$22,200
GRAND TOTALS BY JURISDICTION (ALL FIRES AND UNITS)		
BLM	4 survey sites	$44,400
FWS	2 survey sites	$22,200
GRAND TOTALS		**$66,600**

UNITED STATES
Department of the Interior

Quino checkerspot butterfly occurances

- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 53
- Quino Occurance Complex
- Quino recovery unit
- Otay fire perimeter
- USFWS/BLM owned or managed lands
- CDFG owned lands
- Lakes
- Highways
- Major roads
- add_data

Sources: CDFG, OES, Sandag, SanGIS, Tele Atlas, USFWS

SAN DIEGO

Meters

0 1,500 3,000 4,500

U.S. Fish & Wildlife Service
6010 Hidden Valley Road
Carlsbad, CA 92009
(760) 431-9440
Prepared by E Luciani
February 12, 2004
/emilie/maps/qcb_fire.mxd

Proctor Valley
CDFG/USFWS Site 2

Rancho Jamul
CDFG/BLM Site 2

Dulzura BLM Site 3

Otay Lakes
CDFG/USFWS Site 1

Tecate Truck Trail
BLM Site 1

Marron Valley
BLM Site 4

SWEETWATER
RESERVOIR

OTAY
RESERVOIR

805

MEXICO

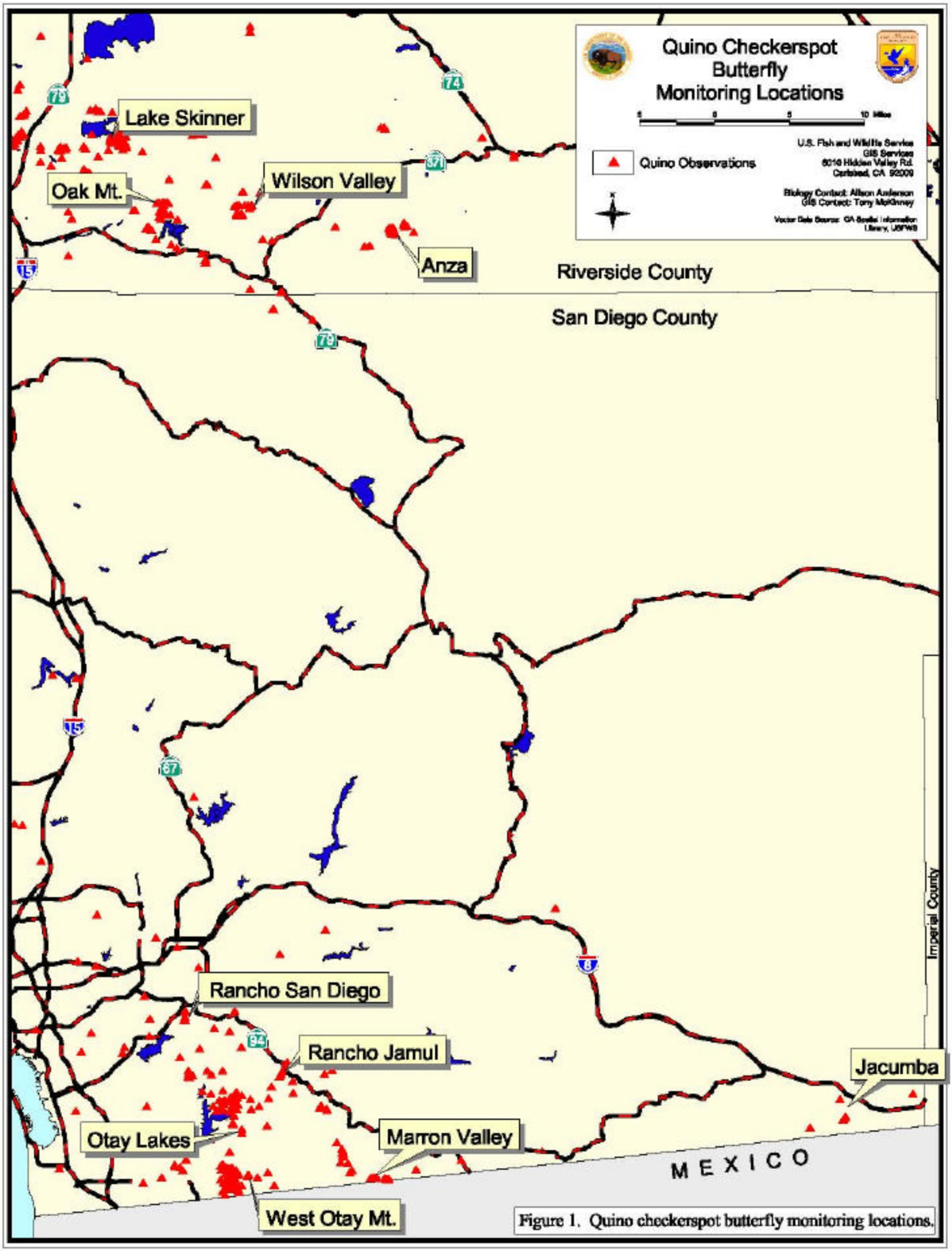


Figure 1. Quino checkerspot butterfly monitoring locations.